Does TV Make You Smarter ?

menu
Television
Reading vs TV
Playing vs TV
School & TV
Intelligence & TV
ADD/ADHD & TV
Children & TV
Young Children & TV
Addiction & TV
Depression & TV
Aggression & TV
Alzheimer's & TV
Obesity & TV
Health & TV
Consumerism & TV
Correlation/Causation
Brainwaves
Brainwaves & TV
Brainwaves 2
Brainwaves Published
Krugman
More on EEG
Orienting
What To Do
What To Do
What To Do Instead
Turn-off Tips
Websites
Reading List
Comments
Forum
Blog - tvSmarter
Blog - Unplug
Comments / Email
Links
Stats-Kids
Stats
Smarter
Cartoon
Leaflets
Democracy
Democracy & TV

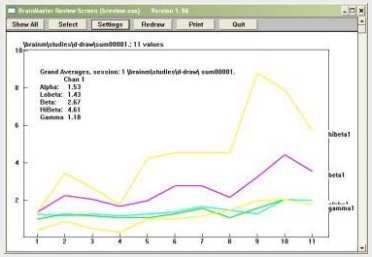
www.tvSmarter.com

whitedotboard.org
the international TV-free community

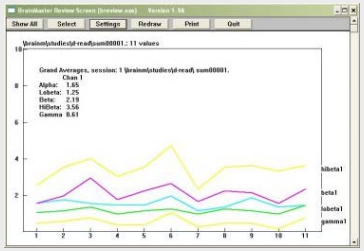
Brainwaves & TV

See also **TV & Brainwaves Published Studies**

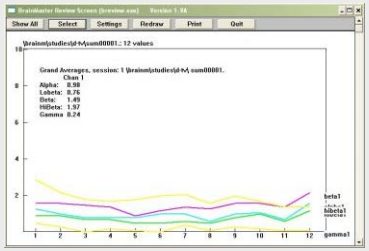
Sample Brainwaves
while drawing:



Sample Brainwaves
while reading:



Sample Brainwaves
while watching TV:



Brainwaves: A Comparison of the Samples

	Drawing	Reading	Watching TV
Alpha:	1.53	2.16	1.43
Lobeta:	1.43	1.30	1.24
Beta:	2.67	0.85	0.98
Hibeta:	4.61	4.50	2.41
Gamma:	1.18	0.23	0.06

Brainwave Types

Alpha: 8 Hz to 12 Hz, associated with relaxation

Lo-Beta: 12 Hz to 15 Hz, normal waking consciousness

Beta: 15 Hz to 18 Hz, normal waking consciousness

Hi-Beta: 19 Hz to 25 Hz, normal waking consciousness

Civil Society & TV
Post-Literate
Propaganda1 & TV
Propaganda2 & TV
Torture & TV
Reference
Reading2
Cunningham
Gore
Johnson
JohnsonMD
Kubey
Kubey2
Putnam
Video Games
Voting
Alpha Waves & TV
Internet
Multitasking
Beetles
Siege

The electrode was placed at the **Fp1 position,** and the subject's brainwaves were measured for 11 to 12 minutes for each activity using the BrainMaster 1.9A EEG and software. Graph is based on Root-Mean-Square (RMS) scale.

Gamma: 26 to 100 Hz, associated with perception and consciousness and higher mental activity

How Does TV Effect Brainwaves?

"Formal Features" are the camera cuts, pans, zooms etc. used very frequently in TV and movies. Because these "formal features" are so novel, and different from normal everyday reality, they trigger the brain's "orienting response". The "orienting response" is an important brain reflex that alerts us when there is a change in the environment. This "orienting response" is an essential survival mechanism because it ***forces*** us to pay attention to any (potentially dangerous) changes in the environment. Because of the involuntary nature of the "orienting response", another name for it is **"*involuntary attention*"**.

It turns out that the "orienting response" has a particular brainwave effect. Namely, when the "orienting response" is triggered, the alpha brainwaves decrease. This decrease in alpha waves has the effect of making the brain more alert. Once the brain ascertains that whatever triggered the "orienting response" is not a threat, the Alpha brainwaves quickly return to their previous level.

Also, during the "orienting response" ("involuntary attention") the Gamma brainwaves disappear. This decrease in Gamma waves has the effect of breaking the person's focus. Unlike the Alpha brainwaves, the Gamma brainwaves have a harder time returning to their previous levels. If the "orienting response" is triggered too often (as with TV watching) the brain stays unfocused.

For example: say you are quietly sitting in a forest, relaxing and letting your mind drift. All of a sudden you hear a roar. Instantly your "orienting response" is triggered, forcing you out of your reverie, and into a more alert state until you can ascertain what to do. In that case, the "orienting response" has had the effect of speeding up your brainwaves, from alpha (relaxation) to beta (alert). Now, lets repeat this little thought experiment, but with a difference. Say you are sitting in a forest playing your guitar. All of a sudden you hear a roar. Instantly, your "orienting response" is triggered, breaking your concentration, and putting your brain into an alert (but not focused) state until you can ascertain what to do. In that case, the "orienting response" has had the effect of slowing down your brainwaves, from hi-beta and gamma (focused concentration) to beta (alert).

And that is *how* watching television effects the brainwaves. The frequent "formal features" such as camera cuts and zooms, trigger the viewer's "orienting response" over and over again. The result is a brain that is alert, but not focused. The greater the frequency of these formal features, the fewer the number of fast brainwaves, the less focused the mind.

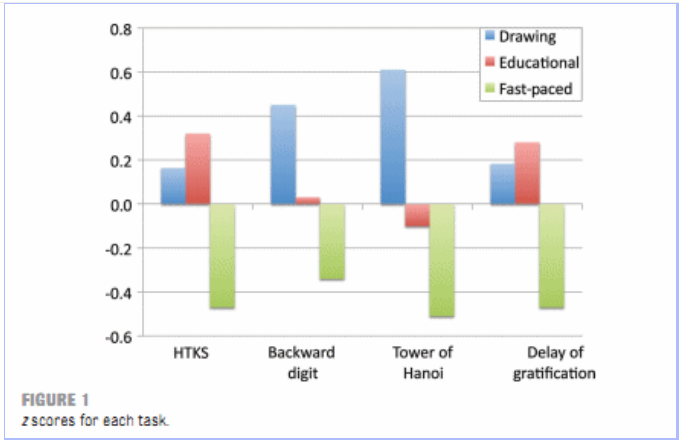


FIGURE 1
z scores for each task.

"Does SpongeBob wreck children's ability to concentrate?... Sixty American four-year-olds were randomly assigned to three groups. One watched a nine-minute clip of the popular US cartoon SpongeBob SquarePants, in which scene changes occurred on average every **11 seconds**. Another group watched an educational cartoon of the same length with scene changes every **34 seconds** on average, while the final group were given crayons, marker pens and paper, and allowed to draw. - Los Angeles Times (Sept 2011) and Pediatrics (Sept 2011) and Medical News Today (Sept 2011) and USA Today (Sept 2011) and Science Daily (Sept 2011) and Mail Online (Sept 2011) and Researcher (Sept 2011) and PsychCentral (Sept 2011) and Earth Sky (Sept 2011) and Obesity Panacea (Sept 2011) and The New York Times Blog (Sept 2011) and NEW! San Francisco Chronicle (Sept 2011) and US News Health (Sept 2011) and Psypost (Sept 2011)

Note: the Orienting Response has been a natural part of human (and mammalian) history for millennium. But this is the first time in the history of humankind where people are spending large amounts of time having their Orienting Response evoked continually every 3 to 10 seconds for hours on end. What are the effects on the mind and brain - particularly on the brains of young children.

Note: an important feature of the Orienting Response is Habituation. For example, the sound of a gunshot will trigger the Orienting Response. But if you go to a gun range and hear the sound of gunshots over and over again, your brain will habituate, and the Orienting Response will no longer be triggered. While watching TV, doesn't the brain Habituate to the "formal features"? No, for some reason the brain does **not** Habituate to the "formal features" of TV. Perhaps because the "formal features" of TV portray a reality that is so very different from actual reality (in real life viewpoints and scenes do not change instantaneously). Perhaps our brains are hardwired to **always** take note of novel and/or instantaneous activity.

Why Does this Matter?

Gamma brainwaves are very important:

"Gamma waves are fast, high-frequency, rhythmic brain responses that have been shown to spike when higher cognitive processes are engaged. Research in adults and animals suggests that lower levels of gamma power might hinder the brain's ability to efficiently package information into coherent images, thoughts and memories." - Science Daily (Oct 2008) See also Associated Content (April 2008)

"Analyzing the children's EEGs (electroencephalograms), Benasich and her research team found that those with higher language and cognitive abilities had correspondingly higher gamma power than those with poorer language and cognitive scores. Similarly, children with better attention and inhibitory control, the ability to moderate or refrain from behavior when instructed, also had higher gamma power." - Science Daily (Oct 2008) and more at Scientific Blogging (Oct 2008) and Science Central (Oct 2008)

Effect on Child Brain Development

Children, ages 8 to 14 spend over 4 hours per day (on average) watching TV/videos. Younger children, infancy to age 6 watch an average of one hour of TV daily. So (assuming 1 hour per day for children aged 2 to 8) by age 14, that works out to a total of 10,950 hours or 1.25 years (24 hours per day) in front of the TV.

We know that how a person uses his/her brain during childhood has a huge effect on how their brain develops. Scientists call this Neuroplasticity (Wikipedia).

During TV watching, the viewers' gamma brainwaves almost disappear. For adults, this does not matter so much since their brains are not nearly as "plastic" as a child's brain. What are the effects on a child's developing brain of hours and hours of suppressed fast brainwave activity?

Do children who watch a lot of TV, have slower brainwaves (less Gamma and hi-beta) than children who watch little TV?

Scientific Explanation (1 of 3)

"Early comparisons between EEG while watching TV and EEG while reading were based on the popular as well academic belief that TV viewing is passive. Based on William James' conceptualization of duel attention systems (voluntary and involuntary attention), Krugman (1971) posited that whereas reading involved a series of successive efforts to attend (demanded voluntary attention), TV viewing involved little or no voluntary effort. Using an EEG measure from the occipetal area, Krugman found a preponderance of slow waves (alpha, delta and theta frequencies) whereas the corresponding characteristic response for EEG during reading involved little slow wave activity and considerable high-frequency or beta activity. He interpreted these findings as supporting the idea that the two media are processed differently, consistent with James' idea of two attentional systems." - The Textbook The Neuropsychology of Everyday Life: Issues in Development and Rehabilitation

"It also appears, as suggested initially by the earlier studies of involvement or of eye movement, that the response to print generally may come to be understood as active and composed primarily of fast brain waves, whereas the response to television might be understood as passive and composed primarily of slow brain waves. Further testing is indicated..." from Brain Wave Measures of Media Involvement Reprinted in the book "How Advertising Works" see also Krugman

Scientific Explanation (2 of 3)

"Television Addiction Is No Mere Metaphor" - Scientific American (Feb 2002) and Full Text

"The EEG studies similarly show less mental stimulation, as measured by alpha brain-wave production, during viewing than during reading."

"What is it about TV that has such a hold on us? In part, the attraction seems to spring from our biological "**orienting response**." First described by Ivan Pavlov in 1927, the **orienting response** is our instinctive visual or auditory reaction to any sudden or novel stimulus. It is part of our evolutionary heritage, a built-in sensitivity to movement and potential predatory threats. Typical orienting reactions include dilation of the blood vessels to the brain, slowing of the heart, and constriction of blood vessels to major muscle groups. Alpha waves are blocked for a few seconds before returning to their baseline level, which is determined by the general level of mental arousal. The brain focuses its attention on gathering more information while the rest of the body quiets."

"In 1986 Byron Reeves of Stanford University, Esther Thorson of the University of Missouri and their colleagues began to study whether the simple formal features of television--cuts, edits, zooms, pans, sudden noises--activate the **orienting response**, thereby keeping attention on the screen. By watching how brain waves were affected by formal features, the researchers concluded that these stylistic tricks can indeed trigger involuntary responses and "derive their attentional value through the evolutionary significance of detecting movement.... **It is the form, not the content, of television that is unique**.""

Scientific Explanation (3 of 3)

"These hypotheses were expanded and examined in detail by Weinstein, Appel, and Weinstein (1980). The authors hypothesized that looking at magazine ads would generate more overall beta wave activity, than would looking at television ads... Based on data from 30 women, they found support for their hypothesis that magazine ads generate more beta wave activity..." - The Textbook The Neuropsychology of Everyday Life: Issues in Development and Rehabilitation **page 99**

"Featherman et al. (1979) found a significant decrease in both theta and beta activity during television when compared to reading. However, while television did produce a higher level of alpha than reading, this difference is not significant." - The Textbook The Neuropsychology of Everyday Life: Issues in Development and Rehabilitation **page 100**

"The existence of a relationship between electroencephalographic measurements and TV viewing was demonstrated as early as 1971. In one such study, Shagass et al. (1971) set out to determine is psychiatric patients could be differentiated from normal subjects based on examination of EEG recording made while watching TV. Although this hypothesis was not supported, the researchers did find that alpha was suppressed during TV viewing." - The Textbook The Neuropsychology of Everyday Life: Issues in Development and Rehabilitation **page 98**

"... Shagass et al. (1971) did find that EEG amplitude was reduced during TV viewing..." - The Textbook The Neuropsychology of Everyday Life: Issues in Development and Rehabilitation **page 98**

More on the Orienting Response

The Orienting Response (Involuntary Attention): No Gamma Brainwaves

"Gamma-band response was linked to voluntary shifts of attention, but not to the involuntary capture of attention. The presence of increased gamma responses for the voluntary allocation of attention, and its absence in cases of involuntary capture suggests that the neural mechanisms governing these two types of attention are different." - The Journal of Neuroscience (Oct 2007)

"Specifically, we investigated changes in induced alpha, beta, and gamma activity in 6-month-old infants during repeated presentations of either a face or an object, and examined whether these changes predicted behavioral responses to novelty at test. We found that induced gamma activity over occipital scalp regions decreased with stimulus repetition in the face condition but not in the toy condition, and that **greater decreases in the gamma band were associated with enhanced orienting to a novel face at test**." - MIT Press Journals (Dec 2008)

Involuntary versus Voluntary Attention

"The stimulus acting as a distractor of voluntary attention disrupts the voluntary attention system with stimuli characterized by intensity and suddeness. The psychological study of involuntary attention was based on it's destructive effects on voluntary attention."

"The direct investigation of involuntary attention was initiated by I.P. Pavlov's (1927) discovery of the orienting reflex (OR). In the framework of the physiology of the higher nervous activity, OR research was regarded as a logical extension of physiological research strategies which view psychological phenomenon as complex brain functions."

"... The possibility of looking at this part of the iceburg of OR components was opened by the remarkable discovery of brain waves by H. Berger (1929). It was shown that the alpha-rhythm depression closely corresponds to the OR and involuntary attention." - the textbook "Attention and Brain Function" By Risto Näätänen

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"This study investigated the effects of advertising pacing (i.e. the number of visual cuts in an advertisement) on viewers' voluntary and involuntary attention to an advertisement, as well as its effects on the recall of claim-related and non-claim-related components of the advertisement." - Informaworld (March 2003)

The Orienting Response & Children's Televison

"It has been noted for some time that television can be mesmerizing for young children and that even children with attention deficit disorder, who can pay attention to little else for meaningful periods of time, can stay focused on television. One of the central ways that television succeeds in maintaining the attention of children is through the "orienting response." First

described by Pavlof in 1927, the orienting response can be thought of as the "what's that" reflex. Simply put, it's our brains keen interest in something that is new or unexpected. One can readily imagine why this is (and more importantly was) critical to humans survival." - Pediatrics For Parents

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"Children's programmers use a technique called the "orienting reflex," known as OR, to capture and keep a child's attention. OR works in this way: If we see or hear something the brain doesn't recognize as the correct sequence or a typical life event — such as a dancing alphabet or quick zooms and pans, we focus on it until the brain recognizes that it doesn't pose a threat. The problem with watching too many programs that rely on OR is that real life becomes slow and boring by comparison."

"We think that with continued exposure to high intensity, unrealistic action, you're conditioning the mind to expect that level of input," Christakis explains. When the child doesn't get the fast-paced input that television provides, he or she becomes bored and inattentive." - MSNBC (Sept 2004)

"Conditioning attentional skills: examining the effects of the pace of television editing on children's attention"

"Methods: School children (aged 4–7 years) were randomly assigned to one of two groups. Each group was presented with either a fast- or slow-edit 3.5-min film of a narrator reading a children's story. Immediately following film presentation, both groups were presented with a continuous test of attention."

"Results: Performance varied according to experimental group and age. In particular, we found that children's orienting networks and error rates can be affected by a very short exposure to television."

"Conclusion: Just 3.5 min of watching television can have a differential effect on the viewer depending on the pacing of the film editing. These findings highlight the potential of experimentally manipulating television exposure in children and emphasize the need for more research in this previously under-explored topic." - Acta Pædiatrica (June 2009)

"When a very young child is riveted to the screen, parents may assume it is because the child is interested in the content. In fact, as Christakis points out, the real reason for such fixation could be a primitive reflex known as the "orienting response."" - Brill Baby

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"THE FORMAL PACE OF SESAME STREET OVER 26 YEARS" - Perceptual and Motor Skills (Aug 2004)

Gamma Brainwaves and Recognition

"Lang and her colleagues have also investigated whether formal features affect people's memory of what they have seen.

In one of their studies, participants watched a program and then filled out a score sheet. Increasing the frequency of edits--defined here as a change from one camera angle to another in the same visual scene--improved memory recognition, presumably because it focused attention on the screen. Increasing the frequency of cuts--changes to a new visual scene--had a similar effect but only up to a point. If the number of cuts exceeded 10 in two minutes, recognition dropped off sharply. " - Scientific American (Feb 2002)

"Neural mechanisms of object recognition seem to rely on activity of distributed neural assemblies coordinated by synchronous firing in the gamma-band range (>20 Hz). In the present electroencephalogram (EEG) study, we investigated induced gamma band activity during the naming of line drawings of upright objects and objects rotated in the image plane. Such plane-rotation paradigms elicit view-dependent processing, leading to delays in recognition of disoriented objects. Our behavioral results showed reaction time delays for rotated, as opposed to upright, images. These delays were accompanied by delays in the peak latency of induced gamma band responses (GBRs), in the absence of any effects on other measures of EEG activity. The latency of the induced GBRs has thus, for the first time, been selectively modulated by an experimental manipulation that delayed recognition. This finding indicates that induced GBRs have a genuine role as neural markers of late representational processes during object recognition. In concordance with the view that object recognition is achieved through dynamic learning processes, we propose that induced gamma band activity could be one of the possible cortical markers of such dynamic object coding." - Journal of Cognitive Neuroscience (June 2007)

Orienting Response & Al Gore

Excerpt: 'Assault on Reason' by Al Gore (May 2007)

"An important explanation for why we spend so much time motionless in front of the screen is that television constantly triggers the "**orienting response**" in our brains. As I noted in the introduction, the purpose of the orienting response is to immediately establish in the present moment whether or not fear is appropriate by determining whether or not the sudden movement that has attracted attention is evidence of a legitimate threat..."

"Now, television commercials and many action sequences on television routinely activate that **orienting reflex** once per second. And since we in this country, on average, watch television more than four and a half hours per day, those circuits of the brain are constantly being activated."

"The constant and repetitive triggering of the **orienting response** induces a quasi-hypnotic state. It partially immobilizes viewers and creates an addiction to the constant stimulation of two areas of the brain: the amygdala and the hippocampus (part of the brain's memory and contextualizing system). It's almost as though we have a "receptor" for television in our brains."

More on the Orienting Response

"Reeves et al. (1985) have shown that adult television viewers' attention, measured as the blocking of the alpha frequency in the EEG, another component of the orienting response, is greater immediately following on-screen cuts, scene changes, and movement, regardless of content." - Television and Political Advertising (October 1991)

"By studying the activity of the brain while viewing, Reeves and Thorson discovered that these features of TV programming did, in fact, result in the triggering of this orienting response. “It is the form, not the content, of television that is unique,” Reeves and Thorson said." - The Catholic Exchange (April 2002)

"It also demonstrates that if lectures contain familiar and therefore easier material for viewers to remember, the ORs enhance learning, but if the lectures contain unfamiliar and therefore more difficult material to remember, the ORs interfere with learning. These results extend the idea that attention to television exhibits limited attentional capacity and suggests that there is a trade-off between people's ability to attend to structural and informational aspects of the television stimulus." - Communication Research (1992)

"Experiment 2 assessed attention during the first second after the cut. Related sequences produced longer reaction times immediately following the cut at 10 and 20 frames; unrelated sequences produced longer reaction times further from the cut, at 20 frames, and 1 second. This pattern of results is explained using a dual process model of attention to television." - Communication Research (1993)

"Alpha blocking in response to sensory stimuli starts about 4 seconds after the onset of stimulation, lasts 1-2 seconds of the stimuli are brief, and shows habituation is simple stimuli are repeated. Alpha blocking generally occurs in response to the stimulus variables at elicit the orienting response: novelty, complexity, unexpectedness (Berlyne 1960). In fact, alpha blocking is a regular component of the orienting response." - The Emotions (April 1987)

"The Psychophysiology of Deception and the Orienting Response" - Center for Investigative Psychology

"At unpredictable intervals, the beep is replaced by a different tone (boop). The unexpected tone, the "boop," is the oddball. Oddballs cause a large response a component of the ERP called the P300. The P300 is a response that occurs about 300 milliseconds after the onset of a stimulus, and this "oddball" effect has been conceptually replicated using more complex stimuli like attitudinal issues." - Psychology Today Blog (July 2009)

"There was no significant difference in the results for a static camera versus a moving camera, but viewers were significantly less accurate when they saw an abrupt cut in the movie. This decrease in accuracy was almost entirely found at the point in the movie immediately following the cut, suggesting quite strongly that the cut itself momentarily disoriented viewers." - Cognitive Daily (July 2009)

"Neuroscientists (nor-o-SY-in-tists), or scientists who study the brain and nervous system, believe that attention is largely a function of the brain's reticular activating (re-TIK-yoo-lur AK-ti-vay-ting) system, or RAS... A Russian scientist named Ivan Petrovich Pavlov observed some of the physical signs of attention in dogs and other animals, which came to be known as the orienting response." - humanillnesses.com

More on Gamma Brainwaves

"MIT neuroscientists found that neurons in the prefrontal cortex — the brain's planning center — fire in unison and send signals to the visual cortex to do the same, generating high-frequency waves that oscillate between these distant brain regions like a vibrating spring. These waves, also known as gamma oscillations, have long been associated with cognitive states like attention, learning, and consciousness." - Science Daily (June 2009)

"Functional imaging of human cortex implicates a diverse network of brain regions supporting working memory — the capacity to hold and manipulate information for short periods of time. Although we are beginning to map out the brain networks supporting working memory, little is known about its physiological basis. We analyzed intracranial recordings from two epileptic patients as they performed a working memory task. Spectral analyses revealed that, in both patients, gamma (30–60 Hz) oscillations increased approximately linearly with memory load, tracking closely with memory load over the course of the trial. This constitutes the first evidence that gamma oscillations, widely implicated in perceptual processes, support the maintenance of multiple items in working memory." - Cerebral Cortex (2003)

"These waves, also known as gamma oscillations, have long been associated with cognitive states such as attention, learning and consciousness." - MIT News (May 2009)

"The patterns of these brain waves allowed the investigators to obtain a thorough description of how attention altered neural function." - Science Daily (Dec 2006)

"The suggested mechanism is that gamma waves relate to neural consciousness via the mechanism for conscious attention" - Wikipedia

"Those transformed states have traditionally been understood in transcendent terms, as something outside the world of physical measurement and objective evaluation. But over the past few years, researchers at the University of Wisconsin working with Tibetan monks have been able to translate those mental experiences into the scientific language of high-frequency gamma waves and brain synchrony, or coordination. And they have pinpointed the left prefrontal cortex, an area just behind the left forehead, as the place where brain activity associated with meditation is especially intense. " - The Washington Post (Jan 2005)

"A blue laser shined into a live mouse brain triggered gamma waves, which are a kind of brain wave necessary for concentration and cognition that people with autism and schizophrenia often lack." - The Discovery Channel (April 2009) and The Medical News (April 2009)

"Researchers at the University of Wisconsin-Madison have found that during meditation, Zen Buddhist monks show an extraordinary synchronization of brain waves known as gamma synchrony--a pattern increasingly associated with robust brain function and the synthesis of activity that we call the mind." - Scientific American (March 2005)

"Long-term meditators self-induce high-amplitude gamma synchrony during mental practice." - PubMed (Nov 2004)

Gamma Brainwaves & Working Memory

"Functional imaging of human cortex implicates a diverse network of brain regions supporting working memory — the capacity to hold and manipulate information for short periods of time. Although we are beginning to map out the brain networks supporting working memory, little is known about its physiological basis. We analyzed intracranial recordings from two epileptic patients as they performed a working memory task. Spectral analyses revealed that, in both patients, gamma (30–60 Hz) oscillations increased approximately linearly with memory load, tracking closely with memory load over the course of the trial. This constitutes the first evidence that gamma oscillations, widely implicated in perceptual processes, support the maintenance of multiple items in working memory." - Cerebral Cortex (2003)

"Working memory is the ability to actively hold information in the mind. Recent results demonstrate that working memory is organized by oscillatory processes in the theta and gamma frequency range." - Current Biology (June 2010)

"Maintenance of an increasing number of items elicited an incrementally negative shift of the DC potential and an increase in MTL gamma-band activity." - Journal of Neuroscience (July 2007)

"Studies of working memory load effects on human EEG power have indicated divergent effects in different frequency bands. Although gamma power typically increases with load, the load dependency of the lower frequency theta and alpha bands is uncertain." - Cerebral Cortex (2008)

TV's Effect on the Prefrontal Cortex

"What I like about this interpretation of *Inception* is that it also makes neurological sense. From the perspective of your brain, dreaming and movie-watching are strangely parallel experiences. In fact, one could argue that sitting in a darkened theater and staring at a thriller is the closest one can get to REM sleep with open eyes. Consider this study, led by Uri Hasson and Rafael Malach at Hebrew University. The experiment was simple: they showed subjects a vintage Clint Eastwood movie ("The Good, The Bad and the Ugly") and watched what happened to the cortex in a scanner. The scientists found that when adults were watching the film their brains showed a peculiar pattern of activity, which was virtually universal. (The title of the study is "Intersubject Synchronization of Cortical Activity During Natural Vision".) In particular, people showed a remarkable level of similarity when it came to the activation of areas including the visual cortex (no surprise there), fusiform gyrus (it was turned on when the camera zoomed in on a face), areas related to the processing of touch (they were activated during scenes involving physical contact) and so on. Here's the nut graf from the paper:

- This strong intersubject correlation shows that, despite the completely free viewing of dynamical, complex scenes, individual brains "tick together" in synchronized spatiotemporal patterns when exposed to the same visual environment.

But it's also worth pointing out which brain areas didn't "tick together" in the movie theater. The most notable of these "non-synchronous" regions is the prefrontal cortex, an area associated with logic, deliberative analysis, and self-awareness. **Subsequent work by Malach and colleagues has found that, when we're engaged in intense "sensorimotor processing" – and nothing is more intense for the senses than a big moving image and Dolby surround sound – we actually inhibit these prefrontal areas. The scientists argue that such "inactivation" allows us to lose ourself in the movie**..." - Wired (July 2010)

About the Frontal Cortex

"The most typical psychological term for functions carried out by the prefrontal cortex area is executive function. Executive function relates to abilities to differentiate among conflicting thoughts, determine good and bad, better and best, same and different, future consequences of current activities, working toward a defined goal, prediction of outcomes, expectation based on actions, and social "control" (the ability to suppress urges that, if not suppressed, could lead to socially-unacceptable outcomes)." - Wikipedia

"The study's findings indicate that the less activity there is in the frontal lobe, the more likely we are to see ourselves through rose-colored glasses." - Psychology Today Blogs (Jan 2010)

The Event-Related Potential (ERP) technique

"ERPs are voltage fluctuations in the Electroencephalogram (EEG) elicited by the presentation of a controlled stimulus. The latencies of different positive and negative components in an ERP reveal the time course of activation of the neuronal populations that are recruited during the processing of that stimulus." - Research